Remarks/Arguments:

Claims 9, 21, and 34 are amended for clarity. Claims 9-12, 14-16, 18, 21-30, 32, 34, and 35 are pending. Claims 21-30, 32, and 34 are directed to a process for the control of emissions from a lean-burn internal combustion engine. Claims 9-12, 14-16, and 18 are directed to an emission control system.

The applicant appreciates the Examiner's reconsideration, withdrawal of the finality of the previous rejection, and indication that applicant's remarks were persuasive to overcome the previous rejections of record.

The applicant has structured this Response by first summarizing the Office Action rejections. Then, the applicant addresses the § 112, first paragraph rejections. Next, the applicant discusses the Examiner's characterization of Tsuchitani et al. in reference to the process claims. And finally, the applicant rebuts the Examiner's motivation to combine the prior art references.

I. The Office Action

A. 35 U.S.C. § 112, first paragraph

The Office Action rejects the pending claims under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Office Action states that the term "$\leq$ 30 g/ft^3", more specifically, the symbol "$\leq$" identified as "less than or equal to", is not supported in the specification.

The Office Action also states that the terms "300% or greater", more specifically, "or greater" does not find support in the applicant's specification.

B. 35 U.S.C. § 103(a)

The Office Action rejects claims 9-12, 14-16, 21-30 and 35 under 35 U.S.C. § 103(a) as obvious over Tsuchitani et al. (EP 0 666 099) in view of Shiraishi et al. (JP 03-094818) stating that Tsuchitani et al. discloses the invention but for the volume of the lean NO_x

catalyst system being 300% or greater than that of the volume of the oxidation catalyst. It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to select the appropriate volume ratio in the exhaust system of Tsuchitani et al. in view of the teachings of Shiraishi et al. because Shiraishi et al. discloses a two-catalyst system (A:B) where controlling the volume ratio of A:B in the range of 8:1 to 1:3 improves the purification capacity of the system.

The Examiner also states that the precise volume ratio of the two catalyst system would have been considered a result effective variable by one having ordinary skill in the art, that one skilled in the art would have routinely optimized the volume ratio, and that where general conditions of a claim are disclosed in the prior art (i.e., the volume ratio), discovering the optimum or workable ranges involves routine skill in the art.

II. Support for Applicant's Claim Amendments

The applicant has amended claims 9, 21, and 34 for clarification. The symbol "≤" has been replaced with "<." Support for this amendment is found at page 2, lines 36-38.

The applicant refutes the Examiner's position that the term "300% or greater" describing the volume relationships between two catalyst systems is not supported in the specification. Support for the "or greater" is found in a discussion of space velocity. Space velocity is a function of two variables: The rate of exhaust flow and the volume of a system.

In the instant application, the exhaust flow variable is constant because the two catalyst systems are contained within the same exhaust flow path. When the applicant discloses varying the space velocity of the system, it logically follows that because the exhaust flow rate is constant, to change space velocity, the applicant manipulates the respective volumes of each catalyst system in the two-catalyst system. Bearing this in mind, the disclosure at page 2, lines 10-13 which states, "[t]he first catalyst system is such that the exhaust gases from the engine flow over it at a low space velocity, particularly *below* 40000/hr" implies that there is a minimum tolerable volume for the first catalyst to produce a space velocity of 40000/hr. To go below that space velocity, the second catalyst volume is increased indefinitely. Such is taught

at page 2, line 31 through page 3, line 1: "a lower space velocity may be achieved readily in practice by *increasing* the volume of the catalyst." Note there is no upper limit expressly defined to this increase in volume.

For the second catalyst system, page 2, lines 11-13 state, "[t]he second catalyst system is usually such that the exhaust gases from the engine flow over it at a space velocity of 40000-80000hr^{-1}." Again, with the exhaust flow rate maintained constant, there is a range of catalyst volume that directly determines this space velocity range.

With the above discussion in mind, a comparison of the volumes of the first and second catalysts are defined by a ratio or percentage of the volume of the first catalyst to the volume of the second catalyst. The disclosure at Table 3, specifically, Catalyst system (5), merely provides the lower end of the catalyst volume ratio range as a point of reference (i.e., 3:1 or 300%). The disclosure at page 2, lines 10-13 of applicant's application clearly sets forth that the first catalyst volume can be made increasingly larger without providing an upper limit. This supports the terms of "or greater" as recited in the claims. Reconsideration of the rejection is greatly appreciated.

III. Applicant's Patentably Distinct Process Claims 21-30, 32, and 34

As previously argued in the applicant's August 2, 2004 Response to the Office Action of June 2, 2004, the applicant distinguished the disclosure of Tsuchitani et al. from the applicant's claims. The applicant's remarks were as follows:

> The Office Action cites page 7, line 47-55 of Tsuchitani et al. as disclosing element a) of claim 9 which recites "a lean NOx catalyst system comprising a lean NOx catalyst platinum group metal (PGM) for reducing NOx to N_2 wherein the lean NOx catalyst PGM consists of platinum." The applicant respectfully submits that the Office Action has mischaracterized the citation of Tsuchitani et al.
>
> The paragraph of page 7, lines 47-55 refers to a "catalyst" without mention of its oxidizing or reducing capabilities. The proceeding paragraph, beginning on line 56 of page 7, clarifies which catalyst Tsuchitani et al. is referring, stating, "In the components mentioned above [lines 47-55], such Nobel metals as platinum . . . are effective to oxidize NO_x in an oxidizing

> atmosphere." Because element a) of claim 9 of the present invention is directed to a platinum catalyst for reducing NO_x and the citation of Tsuchitani et al. discusses a platinum *oxidation* catalyst, the applicant submits that this citation of Tsuchitani et al. is in error.

That discussion focused on system claim 9. The applicant appreciates the Examiner's position regarding the multi-function capability of a platinum catalyst depending on the environment in which it is found, i.e., depending on the environment, the platinum catalyst can act as either an oxidation or reduction catalyst.

The applicant's process claims, however, specifically require the step of passing the exhaust gases from the engine over a lean NO_x catalyst *system to reduce NO_x to N_2* (Emphasis Added). The applicant has not found a disclosure or a suggestion in Tsuchitani et al. that reduces NO_x in exhaust gasses to N_2. As cited in the above passage, Tsuchitani et al. describes the absorber/catalyst as an oxidation catalyst (see paragraph [0018]). Tsuchitani et al. is concerned with oxidizing N_2O or NO to NO_x at the absorber/oxidation catalyst. "Reducing" is mentioned in reference to regenerating the NO_x absorber/oxidation catalyst as described by paragraph [0033] and not in reference to reducing NO_x in the exhaust gases to N_2. Therefore, the applicant submits that the Examiner's characterization of Tsuchitani et al. at page 4, paragraph a) of the Office Action is in error. Because Tsuchitani et al. fails to recite each and every limitation of the claimed invention, and Shiraishi et al. fails to fill the void of Tsuchitani et al., the applicant submits that for at least this reason, process claims 21-30, 32, and 34 are in a condition for allowance. Early notification to that effect is earnestly solicited.

IV. Non-obviousness of the Applicant's Invention

The applicant has previously identified an error in the Office Action rejection of applicant's method claims 21-30, 32, and 34. For at least that reason and for the additional reasons discussed below, the applicant again submits that these claims are in a condition for allowance.

Regarding system claims 9-12, 14-16, and 18, the applicant submits that one of ordinary skill in the art would not be motivated by the volume ratio as taught by Shiraishi et al.

to modify Tsuchitanti et al. because the system of Shiraishi et al. is defined by rich or at least stoichiometric conditions (i.e., a low air to fuel ratio) and Shiraishi et al. does not contemplate manipulation of the air to fuel ratio for improving NO_x reduction.

A. Typographical Error in the Abstract of Shiraishi et al.

The applicant submits that the abstract supplied by the Examiner contains a typographical error in the last sentence of the paragraph titled "Constitution." The sentence "[c]onsequently, the purification capacity is improved when the air-to-fuel ratio is high at high temperature," is inconsistent with the remaining disclosure. For example, the third paragraph under the "Prior Art" heading at page 2 of the translation (a copy of which is attached) and the paragraph under the "Problem addressed by invention" heading at page 3, teach that the aim of Shiraishi et al. is to provide "high performance in cleaning the exhaust gas of high HC content discharged in fuel rich environment." A fuel rich environment is, of course, a low air-to-fuel ratio. The applicant thus submits that the Abstract recitation that Shiraishi et al. is directed to purification "when the air-to-fuel ratio is high" is clearly a mistake and not supported by the specification as a whole. This error goes to the very foundation used in the Office Action as motivation to combine the references. The applicant requests the Examiner consider the full translation of Shiraishi et al. and make a record of the full translation in a Form 892.

B. Lack of Motivation to Modify Tsuchitani et al. in view of Shiraishi et al.

As argued above, Shiraishi et al. is directed to stoichiometric or rich air-to-fuel conditions. At these conditions, NO_x is preferentially reduced to N_2 because of the presence of extra HC's in the exhaust gas. In contrast, the present invention is directed to lean conditions. Under lean conditions, there is more O_2 than HC's and the reaction for reducing NO_x is not preferred. The applicant submits that a person of ordinary skill in the art would not look to a reference that solves a problem under stoichiometric or rich fuel conditions (Shiraishi et al.) for a solution to a problem that occurs under lean fuel conditions (the applicant's invention).

Moreover, the applicant submits that a person of ordinary skill in the art would not be motivated to vary the volume ratio of a two catalyst system for reducing NO_x by a reference that fails to recognize that varying the volume between two catalyst systems affects NO_x

reduction. For example, it can be seen from the Working Examples in Shiraishi et al. wherein the catalyst volume ratio, A:B, is varied between 8/1 and 1/3 (see Table 1, final column) that there is no improvement or variation in NO_x reduction (see Table 2). Accordingly, there is no teaching, appreciation, recognition, or suggestion in Shiraishi et al. that increasing the volume of the upstream catalyst would improve NO_x reduction activity.

The reasons Shiraishi et al. obtains a blanket 99% NO conversion is that i) the system of Shiraishi et al. operates under stoichiometric or rich air-to-fuel conditions, as discussed previously, and ii) Shiraishi et al. also includes a three way catalyst (see under first three paragraphs below Prior Art heading on page 2 of the translation). Three way catalysis (TWC) requires substantially stoichiometric conditions in order for the catalyst to oxidize HC to H_2O and CO_2 and CO to CO_2. At the same time, a TWC simultaneously reduces NO_x to N_2.

C. Rebuttal of Examiner's Unsupported Statements at Pages 5 and 6

The Examiner states at pages 5 and 6 that i) the precise volume ratio of the two catalyst system would have been considered a result effective variable by one having ordinary skill in the art, that ii) one skilled in the art would have routinely optimized the volume ratios, and that iii) where general conditions of a claim are disclosed in the prior art (i.e., the volume ratio) discovering the optimum or workable ranges involves routine skill in the art. The applicant rebuts these unsupported statements in turn.

i) The test for determining whether a variable is a result effective variable is not whether it would be considered so by one having ordinary skill in the art, but rather whether the prior art recognizes the specific parameter (in this case, the volume ratio) as result determinative. As discussed above, Shiraishi et al. fails to recognize varying the volume ratio of two catalytic systems as a variable that affects NO_x reduction.

ii) Whether one skilled in the art would routinely optimize the volumes of the catalyst systems is a statement equivalent to whether it would have been obvious to try other

volume ratios to obtain the claimed result. The test for obviousness is not what is obvious to try. See MPEP § 2145.

iii) To reach the conclusion that discovering the optimum or workable ranges involves routine skill in the art when the general conditions of a claim are disclosed first requires a showing that the parameter is a result effective variable. See MPEP § 2144.05. A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). As discussed above, the Examiner has not made such a showing.

V. Conclusion

The Office Action rejection of the applicant's process claims is in error. Tsuchitani et al. does not disclose or suggest the step of passing exhaust gas over a Pt reducing catalyst "to reduce NO_x to N_2" as required in claim 21. The applicant submits that a person of ordinary skill in the art would understand that the language of "300% or greater" is supported by the applicant's disclosure of the manipulation of the space velocity of the catalytic systems. With regard to the system claims, the applicant submits that there is no motivation to modify Tsuchitani et al. in view of Shiraishi et al. because the system of Shiraishi et al. is not under lean conditions and Shiraishi et al. does not recognize the volume ratio as influencing NO_x conversion.

In view of the above, the applicant submits that the pending claims are in a condition for allowance and request early notification to that effect.

Finally, the applicant requests a telephone interview with the applicant's undersigned representatives if such action will expedite the prosecution of the application or if the Examiner has any suggestions or questions concerning the application or the present Response. If the

claims of the application are not believed to be in full condition for allowance, for any reason, the applicant respectfully requests the constructive assistance and suggestions of the Examiner so that the application can be placed in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,

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Enclosure: English Translation of JP 3-94818

Dated: March 9, 2005

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